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H9	Hong Kong				
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K8	Korea				
K9	Korea				
L1	Laos				
L2	Laos				
L3	Laos				

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the suction pad in the middle region of the diaper, wherefore the diapers of this published specification cannot provide the best possible fit and tightness. One further reason for this may be the symmetrical shape of the diaper.

The object of the present invention is to provide a new diaper which avoids the above drawbacks and provides the best possible fit and tightness. This is achieved by means of a diaper according to the invention which is characterized in that the elastic bands are substantially tangent to the suction pad at points within the area of one end of the suction pad and diverge from it substantially linearly at least up to points within the area of the other end of the suction pad. The method of producing a diaper of this kind is characterized in that the elastic bands are arranged to follow zigzag paths which are substantially tangent to the suction pad at points within the area of one end of the suction pad of each diaper and diverge from it substantially linearly at least up to points within the area of the other end of the suction pad.

The points at which the elastic bands are tangent to the suction pad are preferably positioned within the area of the front and of the diaper.

In the diaper of the invention the elastic bands are supported to one end of the suction pad, so that the elastic bands can be properly stretched within the middle region of the diaper, which is to be positioned between the legs of the user, thus raising the edges of the diaper upward and forming a cup-shaped structure which efficiently prevents diaper leakage. As the elastic bands are supported to the suction pad so that the bands can be stretched tight, it can be ensured that the edges of the diaper

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are positioned tightly around the thighs of the user. In the following the diaper of the invention will be described in greater detail with reference to the attached drawings, wherein

Figure 1 shows a first embodiment of the diaper of the invention;

Figure 2 shows a second embodiment of the diaper of the invention;

Figure 3 is a cross-sectional view of the middle region of the diaper of Figure 2 along the line III-III;

Figure 4 shows a third embodiment of the diaper of the invention; and

Figure 5 shows a fourth embodiment of the diaper of the invention.

The diapers shown in Figures 1 to 5 comprise a first surface layer 1 of a material substantially impermeable to liquid, such as plastic, and a second liquid-permeable surface layer 2 to be positioned against the body of the user. An elongated suction pad 3 is fixed between the surface layers. The suction pad may consist of, for instance, cotton or cellulose crush and optionally comprises a region made of a superabsorbent material. Elastic bands 4 and 5 are provided on the sides of the diaper between the surface layers 1 and 2. They are arranged to follow paths reversed with respect to the longitudinal axis of the diaper so that their ends are positioned substantially on the same line in the longitudinal direction of the diaper. This is due to the fact that the diaper of the invention is made of a web formed by the surface layers, the individual diapers being cut off the diaper web. In the invention, the elastic bands 4 and 5, which may be formed by one or more separate bands which may be of different width, are

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disposed between the surface layers 1 and 2 so that they are substantially tangent to the suction pad 3 at points 6 and 7 within the area of one end of the suction pad 3 and diverge from the suction pad at least up to certain points within the area of the other end of the suction pad 3. In Figures 2 and 5, these points are indicated with the reference numerals 8 and 9. It is essential for the operation of the diaper of the invention that the elastic bands 4 and 5 are fixed in at least one of the surface layers 1 and 2 at least between the points 6 and 8 and the points 7 and 9, respectively. In the invention, the points 6 and 7, at which the elastic bands 4 and 5 are tangent to the suction pad 3, are positioned close to the front end of the diaper, that is, close to the end to the positioned at the front of the user.

In the embodiment shown in Figure 1, the elastic bands 4 and 5 are bent only at the points 6 and 7. The elastic bands 4 and 5 are attached to the diaper over their entire length. In the embodiments of Figure 1 and Figure 4, the suction pad 3 is substantially wedge-shaped. As clearly appears from the figures, the elastic bands 4 and 5 diverge from the suction pad 3 in the direction from the points 6 and 7 toward the other end of the suction pad, that is, toward its rear end. This divergence causes the bands 4 and 5 to raise the edges of the diaper upward when the diaper is bent in the middle into the shape in which it is to be used. Another factor contributing to the formation of the cup shape is that the elastic bands 4 and 5 are supported at the points 6 and 7 to the suction pad 3 having a considerably greater rigidity than the rest of the diaper. In this way the elastic bands 4 and 5 are not able to pull together

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the front portion of the diaper as the pad 3 is sufficiently rigid to compensate for the traction forces caused by them. An advantage of this is that the front portion of the diaper will not hang loosely when the diaper is in use. To illustrate the use of the diaper, Figures 1 and 4 show strips 10 and 11 indicated with broken lines. Each strip comprises at least one adhesive tape 12 by means of which the strips are to be fastened to the front portion of the diaper so that they will be positioned within the hip area of the user.

The embodiment of the diaper of the invention shown in Figure 2 differs from the embodiment shown in Figure 1 in that the suction pad 3 is therein somewhat hourglass-shaped and both elastic bands 4 and 5 comprise two bands. So the elastic bands follow a zigzag path over the length of each diaper. As far as the suction pad 3 is concerned, the embodiment of Figure 2 corresponds to that of Figure 5. In the embodiments of Figures 2 and 5, the suction pad generally widens toward its one end, that is, toward its rear end, so that the elastic bands 4 and 5 generally diverge from the suction pad 3 between the points 6 and 8 and the points 7 and 9, respectively. As a result, a similar cup shape is obtained as in the embodiments of Figures 1 and 4 for the same reasons. In the embodiment of Figure 2, the elastic bands 4 and 5 are also fixed in at least one of the surface layers 1 and 2 over their entire length.

The embodiment of Figure 4 deviates from that of Figure 1 in that the elastic bands 4 and 5 have not been glued in sections extending from the points 6 and 7 toward the front end of the diaper. In Figure 4, these sections 13 and 14 are shown as loosely curled band sections extending from points 6 and 7.

in practice, the operation of the embodiment of Figure 4 does not differ from that of the embodiment of Figure 1 to any greater degree. So the band sections 13 and 14 are not of any greater importance for the operation of the diaper. At the production stage these sections 13 and 14 are passed similarly as in the embodiment of Figure 1 to achieve a web of elastic bands for the production of diapers by a web technique.

Figure 5 shows still another embodiment of the diaper of the invention, in which the band sections 13 and 14 extending from the points 6 and 7 toward the front portion of the diaper and band sections 15 and 16 extending from the points 8 and 9 toward the rear portion of the diaper are not fixed. The operation of the diaper of Figure 5 does not differ from that of the embodiment shown in Figure 2. The embodiment also comprises the important features of the invention, that is, the elastic bands 4 and 5 are tangent to the suction pad 3 at points within the front portion of the diaper and diverge from the pad in the direction toward the rear end of the diaper at least up to the points 8 and 9, which in the embodiment of Figure 5 are positioned relatively close to the rear edge of the suction pad 3, being fixed in at least either one of the surface layers between the points 6 and 8 and the points 7 and 9, respectively.

In the production of the diaper of the invention, the surface layers 1 and 2 are both fed in web form, the suction pads being attached by gluing, for instance, to the web 1, for instance, with suitable spacing. The elastic bands 4 and 5 are then fastened by gluing or hot sealing beside the suction pads according to the principles of the invention. Thereafter at least one liquid-permeable surface layer 2

is added to the diaper web. At this stage the web is cut into separate diapers. The required connecting strips can be attached either to the diaper web or to separated diapers by gluing, for instance. Alternatively, the diaper web can be formed by attaching the suction pad 3 and the elastic bands 4 and 5 to the liquid-permeable surface layer 2, the web forming the liquid-impermeable surface layer 1 being attached to the surface layer 2. Furthermore, it is possible to attach the suction pads 3 to one surface layer and the elastic bands 4 and 5 to the other surface layer, whereafter the webs so obtained are joined to form the finished diaper web.

The diaper of the invention and the method of producing such diapers has been described above by way of example by means of some specific embodiments, and it is to be understood that they can be modified in many ways without deviating from the basic idea of the invention and the scope of protection defined in the attached claims. Accordingly, the general shape of the diaper as well as that of the suction pad 3 can be altered without affecting the workability of the idea of the invention. The suction pad, for instance, can be fully rectangular or hourglass-shaped and symmetrical both in the longitudinal and transverse direction. Similarly, the entity formed by the surface layers may be symmetrical both in the longitudinal and transverse direction provided that the elastic bands can be positioned as required by the invention.

## Claims:

1. A method of producing a diaper comprising at least one liquid-impermeable surface layer (1), at least one liquid-permeable surface layer (2), an elongated suction pad (3) disposed between said surface layers, and elastic bands (4, 5) stretched on both sides of the suction pad, the elastic bands (4, 5) being fastened at least over a part of their length to either one of the surface layers (1, 2) and arranged to follow, over the whole length of the diaper, paths reversed with respect to the longitudinal axis of the diaper, the ends of the bands being positioned on the same line parallel with the longitudinal direction of the diaper, wherein the surface layers (1, 2) are fed in web form and the elastic bands as continuous bands and joined with the suction pads to form an integral diaper web which is cut into separate diapers, the longitudinal direction of the diapers corresponding to the longitudinal direction of the webs, characterized in that the elastic bands (4, 5) are arranged to follow zigzag paths which are substantially tangent to the suction pad (3) at points (6, 7) within the area of one end of the suction pad (3) of each diaper and diverge from it substantially linearly at least up to points (8, 9) within the area of the other end of the suction pad.

2. A diaper comprising at least one liquid-impermeable surface layer (1), at least one liquid-permeable surface layer (2), an elongated suction pad (3) disposed between said surface layers, and elastic bands (4, 5) stretched on both sides of the suction pad (3), the elastic bands (4, 5) being fastened at least over a part of their length to either one of

the surface layers (1, 2) and arranged to follow, over the whole length of the diaper, paths reversed with respect to the longitudinal axis of the diaper, the ends of the bands being positioned on the same line parallel with the longitudinal direction of the diaper, characterized in that the elastic bands (4, 5) are substantially tangent to the suction pad (3) at points (6, 7) within the area of one end of the suction pad (3) and diverge from it substantially linearly at least up to points (8, 9) within the area of the other end of the suction pad (3).

3. A diaper according to claim 2, characterized in that the points (6, 7) at which the elastic bands (4, 5) are tangent to the suction pad (3) are positioned within the area of the front end of the diaper.

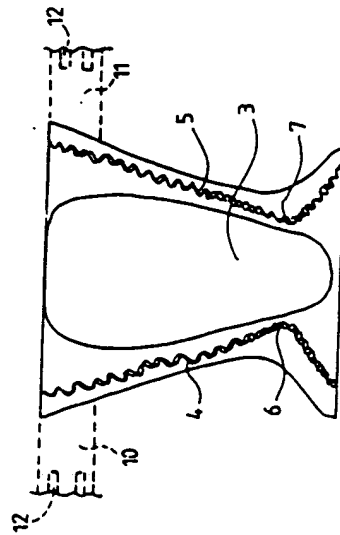


FIG. 1

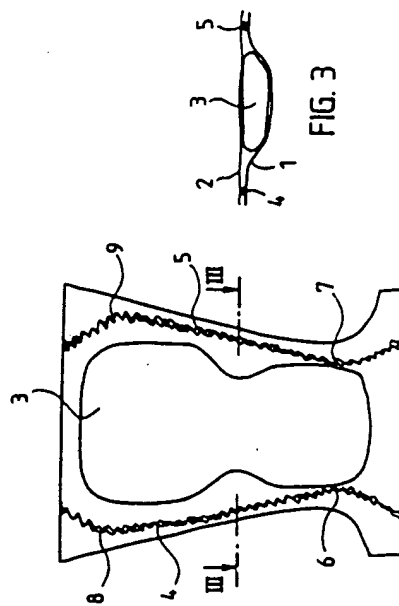


FIG. 2

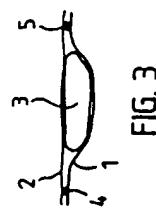


FIG. 3

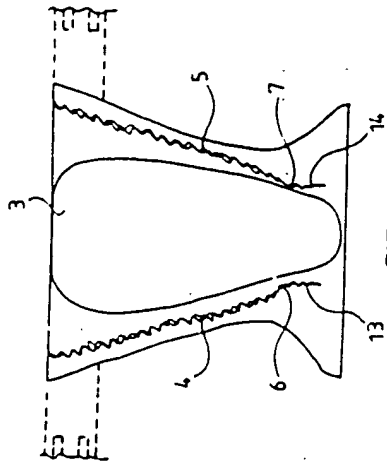


FIG. 4

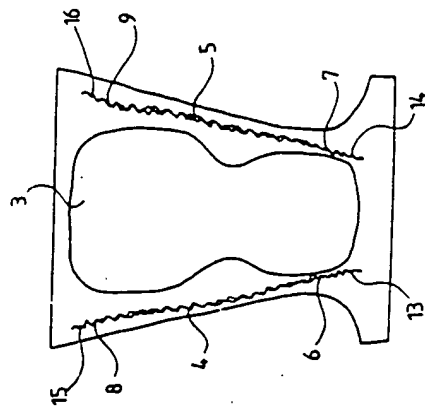


FIG. 5

**International Applications No** **PCT/FI 90/00047**

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1. CLASSIFICATION OF SUBJECT MATTER (In case of classification symbols apply, indicate all)

IPCS: A 61 F 13/15  
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IPC5: A 61 F 13/15

**H. FIELDS SEARCHED**

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**III. DOCUMENTS CONSIDERED TO BE RELEVANT:**

Company	Citation of Document, <sup>11</sup> and indication, where appropriate, of the relevant paragraph(s)	Reference to Citation No., if
7 DE.	A1_3423644 (PAUL HARTMANN AG) 2 January 1986, see page 9, line 18 - line 19  --  EP, A1_0194453 (EXQUISIT KURT GÖTZ) 17 September 1986, see figure 1  --  -----	1-3         1-3

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DE-A1- 3423644	86-01-02	NONE	
EP-A1- 019453	86-09-17	DE-U-	8514294 85-06-27